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EXAMINER

FULLER, ERIC B

ART UNIT PAPER NUMBER

1762

DATE MAILED: 02/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/837,265

Applicant(s)

CHURCH ET AL.

Examiner

Eric B Fuller

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 6-46 is/are pending in the application.
- 4a) Of the above claim(s) 29-42 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 6-28, 43 and 46 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 13, 17-20, 22, and 43-46 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description and enablement requirements. The claims contains subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. The claims also contain subject matter that was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In particular, claim 1 now recites that the bottom of the material is heated by the substrate in such a way to allow a thermal spread throughout the material. Additionally the claim reads to completely sinter the individual particles. Claims 13, 17-20, 22, and 43-46 are all dependent on claim 1 (directly or indirectly). These claims contain limitations drawn to either not sintering the middle and bottom layers of the material or providing a thermal barrier protective layer on the substrate. The specification fails to teach embodiments where the material is heated by the substrate in combination with a protective layer on the substrate or without sintering the bottom layer. Further, the

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specification is not enabled on teaching how one would heat the bottom of the material by the substrate when there is a thermal boundary layer between the two. The specification is also not enabling for heating the bottom of the material by the substrate, causing a thermal spread, and completely sintering the individual particles while not sintering the middle and bottom layers.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 13, 17-20, 22-28, and 43-46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that the applicant regards as the invention.

These claims are confusing because of the above-mentioned issues.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 6-16, 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swain (US 4,427,723) in view of Brusasco (US 5,143,533), or vice-versa.

Swain teaches an annealing (sintering) process that uses a laser to heat the coating material and the substrate in order to promote annealing of the coating material

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and to facilitate bonding of the material to the substrate (column 2, lines 19-40). The heated substrate heats the bottom layer of the material, causing the material to bond to the substrate. It is taught that the thermal stresses on the substrate are minimized allowing for various substrates to be used (column 4, lines 35-40). This reads on the substrate not being damaged. It is taught that the pulse rate and laser intensity are controlled so that the penetration depth of the laser is controlled, thus determining if the material is being bonded to the substrate and/or the top layers are being annealed (column 4, lines 11-39). If the substrate is being heated, then the temperatures of the material and the substrate are similar and adhesion occurs. If the penetration depth is set so that the substrate is not heated, the temperatures are dissimilar and only annealing of the coating material occurs; the enhancement of adhesion stops. The reference is silent in teaching that the coating material comprises particles that are sintered together during the annealing process, but does teach that the annealing process may be used with other coating methods and materials other than that explicitly disclosed (column 4, lines 11-15).

Brusasco teaches a sol-gel coating method in which the particles of the coating material are sintered by a laser in order to cause bonding of the particles with the substrate and with each other. The reference is silent to the bottom of the coating being heated by the substrate.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the sol-gel coating of Brusasco in the process taught by Swain. By doing so, one would have a reasonable expectation of success, as

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Swain teaches that other coating processes and materials that need annealing may be used and Brusasco teaches processes and materials that require annealing.

It also would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the annealing process taught by Swain in the coating process taught by Brusasco. By doing so, one would have a reasonable expectation of achieving adequate material-to-substrate bonding strength, as Brusasco teaches it is desirable to have such a bond, but is silent to how it is achieved, and Swain provides a teaching of how to achieve such a bond.

As to claim 11, to determine the peak power of the laser would have been within the skill of one practicing in the art, through routine experimentation, in order to achieve the penetration and heating requirements taught by Swain.

As to claim 16, the references fail to teach to monitor the behavior of the heat in the material. However, to do so would have been obvious to one skilled in the art in order to achieve uniformity and reproducibility of multiple applications of the process. A thermal-imaging camera, being known in the art, would have been an obvious way to do this.

As to claim 22, by setting the penetration depth to include on top layers of the material, as is embodied by Swain, the top layer of the coating material taught by Brusasco would form an amorphous state that diverts energy of the laser (Brusasco; column 2, lines 35-38).

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As to claim 23, to have a feedback control system would also have been obvious at the time the invention was made to a person having ordinary skill in the art in order to ensure reproducibility of the process.

Claims 17, 18, and 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swain (US 4,427,723) in view of Brusasco (US 5,143,533), or vice-versa, as applied to claim 1 above, and further in view of Ladd et al. (US 6,100,463).

Swain, in view of Brusasco, or vice-versa, teaches the limitations of claim 1. The references fail to teach the use of a thermal barrier layer over the substrate in order to protect the substrate from the heat associated with sintering. However, Ladd teaches that aerogels are used as spacer materials when thermally isolating portions of a semiconductor wafer (column 4, lines 15-30). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize aerogel, as a thermal barrier, to protect the substrate from damage from the heat produced by the sintering process. Since the materials in the reference are the same as that claimed by the applicant, it is the examiner's position that it is inherent that the aerogel also acts to increase adhesion of the sintered material.

Claims 19, 20, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swain (US 4,427,723) in view of Brusasco (US 5,143,533), or vice-versa, as applied to claim 1 above, in view of Ladd et al. (US 6,100,463), as applied to claim 18 and 44 above, in view of Kirkpatrick (US 4,151,008).

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Swain teaches a sintering process for increasing the adhesion of a coating material to a substrate where thermal stresses to the substrate is minimized, such that the substrate is not damaged. The reference also teaches that various substrates may be used. The reference fails to explicitly teach that the product is an electronic component. However, Kirkpatrick teaches that semiconductor devices are made by sintering metal-semiconductor interfaces (column 5, lines 55-60). As the substrate in this case is subject to thermal stresses, it would have been obvious to use such material in the process of Swain, in view of Brusasco. By doing so, one would reap the benefits of producing the semiconductor device without damaging the substrate.

Claims 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swain (US 4,427,723) in view of Brusasco (US 5,143,533), or vice-versa, as applied to claim 23 above, and further in view of Kriegel et al. (US 6,300,256 B1).

Swain, in view of Brusasco, or vice-versa, teaches or makes obvious the limitations of claim 23. The references fail to teach the use of a pyrometer in order to provide the input of the feedback controller. However, one skilled in the art would recognize that a temperature would be the desired input for the controller as it is taught that temperature control is crucial to the sintering process. Additionally, Kriegel teaches using a pyrometer to determine the temperature of a semiconductor (column 12, lines 5-10). This is done to ultimately control the temperature and temperature gradients of the substrate. The benefit of the pyrometer is that the temperature can be determined without contacting the substrate (column 3, lines 35-37). Therefore, it would have been

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obvious at the time the invention was made to a person having ordinary skill in the art to utilize the pyrometer in order to determine the temperatures at selected areas of the substrate without making any contact that might disturb the system.

To have the pyrometer connected to a computer that controls the parameters of the laser would have been obvious to one skilled in the art. It is the examiner's position that the control loop would inherently have to be either open or closed. To provide an interface for real time use by end users, such as to CAD software, would also have been obvious to one skilled in the art such that full automation can be achieved and design changes are instantaneously performed.

Response to Arguments

The applicant has amended the claims such that they include limitations of claims 2-4 in the independent claim. Applicant argues that the process of Wadman fails to teach all the limitations of claim 1 as it has been amended. Examiner agrees and has withdrawn the rejection based on Wadman accordingly. The applicant's arguments are moot in view of the new grounds of rejection. It is noted that because some limitations from claim 3 have not been included in the amendment to claim 1 (the laser interacting with the substrate), the amendment to claim 1 is a new issue, warranting the finality of this rejection.

Conclusion

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The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Setsune et al. (US 5,527,767) teaches a method of laser sintering with a substrate heater (column 5, lines 1-34).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (571) 272-1420. The examiner can normally be reached on Mondays through Thursdays.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P Beck, can be reached at (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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